Fisheries and Oceans Canada | Pêches et Océans Canada
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Maritimes Region
Canadian Science Advisory Secretariat
Science Advisory Report 2009/029

EVALUATION OF ATLANTIC STURGEON (*ACIPENSER OXYRINCHUS*) IN THE MARITIMES REGION WITH RESPECT TO MAKING A CITES NON-DETRIMENT FINDING

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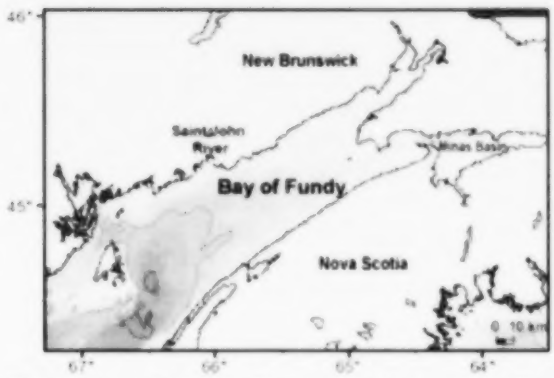


Figure 1. Bay of Fundy location map. The approximate locations of the Saint John River and the Minas Basin are also shown.

Context :

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a legally binding multilateral environmental agreement that aims to ensure that international trade of species does not threaten their survival in the wild. Under the Convention, evaluations must be conducted to determine if the export of a species will be detrimental to its survival in the wild (i.e., a non-detriment finding). Fisheries and Oceans Canada (DFO) has the delegated responsibility from Environment Canada for the issuance of CITES export permits for Canadian aquatic species, which must be accompanied by a positive non-detriment finding (NDF).

DFO has received an application to export specimens and products of wild Atlantic sturgeon (Acipenser oxyrinchus) captured from the Saint John River, New Brunswick. Atlantic sturgeon is listed on Appendix II of CITES and, therefore, an evaluation of the sustainability of the total removals of Atlantic sturgeon from the Bay of Fundy and its associated estuaries is necessary to inform the non-detriment finding (NDF).

SUMMARY

- The abundance of Atlantic sturgeon in the Saint John River has never been formally assessed, and the current population size is unknown.
- Age structure of Atlantic sturgeon in the Saint John River is unknown. Length data collected from the commercial harvest in 1998/1999 and 2007/2008 indicates a similar size structure in these two time periods. Application of the size at age curves from the St. Lawrence River population indicates that the age distribution of spawners in the exploitable population in the Saint John River is likely broad with at least 20 age classes represented.

June 2009

Canada

- More females were captured in 2007/2008 than in 1998/1999, which suggests mature females currently comprise a larger component of the exploitable population.

- Current recruitment of Atlantic sturgeon is unknown but is suspected based on the ongoing presence of juvenile fish in the Saint John River and the broad size structure of the exploitable population. Preliminary data also suggests that there may be an abundance of juveniles in the Minas Basin, although it is not clear if these fish are residents in the Bay of Fundy.

- The primary source of human-induced mortality of Atlantic sturgeon in the Saint John River is from the commercial fishery. The recreational fishery has a release rate of approximately 98%, and survival of sturgeon released live is considered to be very high. Some sturgeon are authorized by DFO to be caught and retained for aquaculture purposes (i.e., for breeding). It is prohibited to retain Atlantic sturgeon captured as bycatch in other fisheries. The Annapolis Tidal Generating Station is known to be a source of mortality for Atlantic sturgeon in the Bay of Fundy; however, the number of individuals reported to be killed each year is low (<5) and the proportion of these that are from the Saint John River is not known.

- The total number of Atlantic sturgeon removed (all sources) from the Bay of Fundy population each year has not been accurately quantified. However, the number of fish removed by the commercial fishery (only in the Saint John River) is estimated to be approximately 400 individuals per year since 1965. In 2005, the recreational fishery removed a possible 41 Atlantic sturgeon.

- At present, DFO does not possess sufficient information to allow for accurate estimation of the potential harvestable surplus of Atlantic sturgeon from the Bay of Fundy, nor specifically from the Saint John River. However, there is no evidence that the average annual reported landings from 1965-2002 of 12.6 mt, or approximately 400 fish, has resulted in any significant changes to the observed relative abundance or age structure of Atlantic sturgeon in the Saint John River.

- The exploitable population of Atlantic sturgeon in the Saint John River appears to have a healthy age structure and has supported an average annual commercial harvest in the order of 400 fish per year over the past 40 years. Other sources of human-induced mortality on Atlantic sturgeon in the Bay of Fundy are thought to be low and in the order of approximately 50 fish per year. Non-fishery sources of human-induced mortality are not expected to change from present levels during the next 5 years.

- A maximum commercial harvest of 350 Atlantic sturgeon from the Saint John River is considered to be sustainable over the short-term (5 years). The sex ratio of this harvest should also be taken into consideration, with a suggested male to female ratio close to 50:50.

- A formal species assessment including the acquisition of robust life history, abundance, and age-structured genetic data is recommended before future harvests are considered.

INTRODUCTION

Biology

Atlantic sturgeon (*Acipenser oxyrinchus*) is a demersal, anadromous species distributed along the Atlantic coast of North America from the southern US to Labrador. Spawning in Canadian

waters is thought to occur in at least two locations, the St. Lawrence River, Québec and the Saint John River, New Brunswick. There is known to be some mixing of Atlantic sturgeon from US waters into the Bay of Fundy (4 tag recaptures have been reported to date). No tagged fish from the Saint Lawrence River have been recaptured in the Bay of Fundy. Atlantic sturgeons that are native to the Bay of Fundy and the St. Lawrence River are considered to be discrete populations (King et al. 2001; Grunwald et al. 2008).

Based on existing information, the Saint John River estuary is considered to be a spawning location for Atlantic sturgeon in the Bay of Fundy. There is a possibility that other spawning locations exist within the Bay of Fundy, but this has not been substantiated to date. In the Saint John River, an upstream run of Atlantic sturgeon occurs between the end of May and August each year. Anecdotal evidence suggests that some Atlantic sturgeon enter the river system one year and remain to spawn in the subsequent year (for example, sturgeon have been observed at the mouth of Washademoak Lake during November). Eggs are thought to be deposited on hard surfaces on the bottom where they adhere until hatching. Juvenile sturgeon typically remain in freshwater for their first summer before migrating to estuaries in winter. By 3 to 5 years of age, the range of juveniles extends into the marine environment where they are thought to migrate along the coast following temperature gradients until maturity (Dovel and Berggren 1983; Stevenson 1997). Juvenile Atlantic sturgeon are abundant in the Minas Basin, where they are thought to feed during the summer (Wehrell 2005; Dadswell 2006).

Atlantic sturgeon can reach sizes of 430 cm and weights of 363 kg. They are long lived, reaching ages in excess of 60 years for females and about 30 years for males. Atlantic sturgeon in the St. Lawrence River are thought to reach maturity in 27 to 28 years (Scott and Crossman 1973), although they may reach maturity sooner in the Saint John River. The presumed length at first maturity for Atlantic sturgeon is ~120 cm. Atlantic sturgeon are highly fecund, with total egg production increasing proportional to body size and ripe ovaries amounting to as much as 25% total weight (Smith 1985). Females generally spawn once every 2 to 6 years and males are generally thought to spawn every 1-5 years. New information being collected in the US suggests that spawning may occur more frequently than previously thought.

Growth rates of adult Atlantic sturgeon in the St. Lawrence River have been measured to be ~2.5 cm (~1 inch) per year (Magnin 1964), and were found to be ~5 cm (~2 inches) per year in the Hudson River (Kahnle et al. 2007). The growth rates of Atlantic sturgeon in the Saint John River are expected to fall within this range.

Rationale for Assessment

DFO has received an application for the export of specimens and products of wild Atlantic sturgeon (*Acipenser oxyrinchus*) captured from the Saint John River, New Brunswick. Atlantic sturgeon is listed on Appendix II of CITES and is considered by CITES to be a shared stock with the United States. In order to make a CITES non-detriment finding (NDF), a review of the sustainability of the total removals of Atlantic sturgeon (i.e., the legal harvest plus other sources of mortality) in Canada must be evaluated.

The Fishery

In Canada, the licensed fisheries for Atlantic sturgeon occur in the Bay of Fundy and the St. Lawrence River. As Atlantic sturgeon from the St. Lawrence River are considered a discrete population from those found in the Bay of Fundy, and fish caught in the St. Lawrence River are not exported from Canada, only the fishery in the Bay of Fundy will be described in this report.

Commercial Landings

The record of reported landings for Atlantic sturgeon caught in the Saint John River begins in 1895 and is virtually uninterrupted to the present day. The record of landings for the period 1895-1975 is widely variable ranging from 0 to ~10.7 mt annually with average annual landings of ~4-5 mt/year (Figure 2). Fluctuations in catches during this 60 year period are thought to better reflect fishing effort, location, and market demand than stock size.

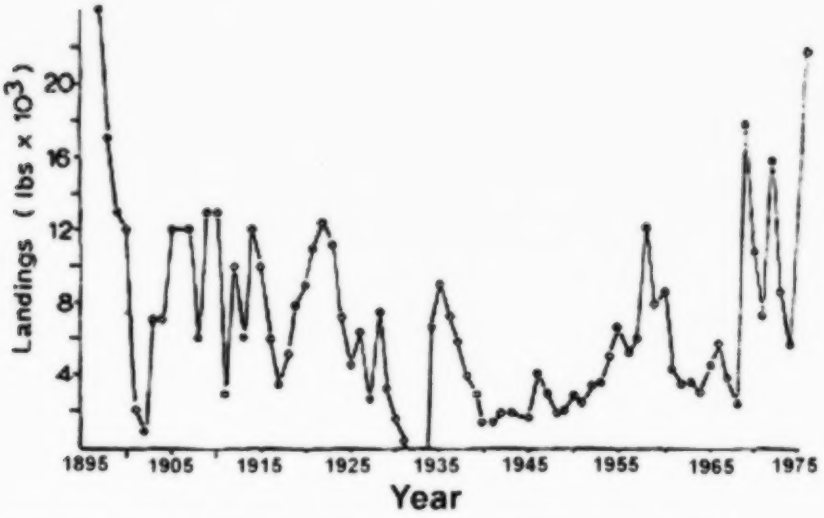


Figure 2. Historical landings of Atlantic sturgeon in the St. John estuary for 1895-1975.

Annual landings from the Saint John River fishery for the years 1965-2002 ranged from 1.2 to 41.2 mt/year with an average of ~12.6 mt/year (Figure 3). DFO Science records indicate that landings were likely under-reported from 1965-1985, as data was compiled using primarily purchase slips and supplementary reports. Since around 1985, there has been a legal requirement for sturgeon harvesters to provide catch and effort information, so it is assumed that these provide a more accurate record of total catch. From 1985-2002, landings ranged from 2.5 to 41.2 mt/year, with an average of ~13.8. In 1999 and 2000, total landings were uncharacteristically low (3.2 mt and 2.5 mt, respectively) and were likely related to the most active commercial fish harvester on the river leaving the fishery; this person also fulfilled the role of the local broker for most of the other licensed fishers.

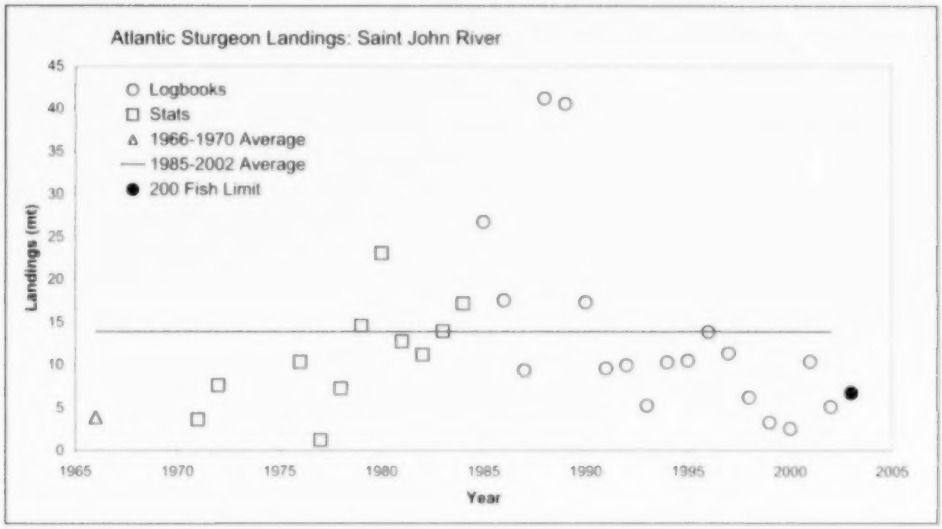


Figure 3.Reported landings of Atlantic sturgeon from the Saint John River estuary for 1965-2003.

Recreational Fishery

There is a recreational fishery for Atlantic sturgeon in New Brunswick. In the past, there have been several sturgeon angling tournaments on the Saint John River. Tournament entry rules required live release of all angled sturgeons. According to the 2005 Recreational Fisheries Survey for Canada, non-tournament angling also occurs in New Brunswick. A total of 2339 sturgeon were angled in New Brunswick in 2005, but only 41 fish were retained. While the angled sturgeon likely included both shortnose and Atlantic sturgeon, the 41 retained were most likely immature Atlantic sturgeon because the minimum size limit for retention is 120 cm.

Aboriginal Fishery

There are currently two Aboriginal fishing licenses that authorize Atlantic sturgeon harvest in the Maritimes Region (Oromocto First Nation and the New Brunswick Aboriginal Peoples Council). These licenses have not reported any landings of sturgeon in the past five years.

Aquaculture

There is one active sturgeon aquaculture facility in New Brunswick, and another operation under development. There are two options available for aquaculturists to obtain wild Atlantic sturgeon in the Maritimes Region. They may purchase sturgeon which have been legally caught in the commercial fishery (and reported in the commercial landings records), or in the event that a commercial supply is not readily available, they may apply to DFO for written permission under the *Fisheries Act* to fish for broodstock. Any such permission imposes terms and conditions with respect to the quantity and size of fish that may be taken, the gear that may be used, and the facility where the fish will be kept. Annual reporting is also required.

From 2003 – 2008, DFO issued licenses to authorize the collections of gametes from 10 pair of Atlantic sturgeon annually, with the fish being returned to the water immediately after gametes were obtained at the river. In 2002, 16 mature adult Atlantic sturgeon were authorized to be retained for artificial breeding, while another 20 were authorized to be retained in 2003. In 2001, there was a license that authorized the collection of 8 Atlantic sturgeon for larval studies, but the fish were purchased from commercial fishers and should have been accounted for in the

commercial fishers logs. In 2000, there was another license that authorized the collection of 4 mature and 4 immature Atlantic sturgeon for assessment of sexual maturity and spawning.

ASSESSMENT

Abundance

The abundance of Atlantic sturgeon in the Saint John River has never been formally assessed, and the current population size is unknown. The largest number of individuals captured in the fishery any one year was approximately 600 adults.

Exploratory research conducted by DFO Science around the late 1970s and M. Dadswell during 1973-1975 indicated that juvenile Atlantic sturgeon were readily captured in the Saint John River; experimental catch rates were 80-90 fish per 90 m net per night.

Recent preliminary estimates of the numbers of large (10-20 yrs old) juvenile and sub-adult Atlantic sturgeon in the Minas Basin portion of the Bay of Fundy based on mark-recapture of tagged individuals suggest that they likely occur in the thousands (M. Dadswell, Acadia University, pers. comm.). The origin(s) of these fish is not currently known.

Population Structure

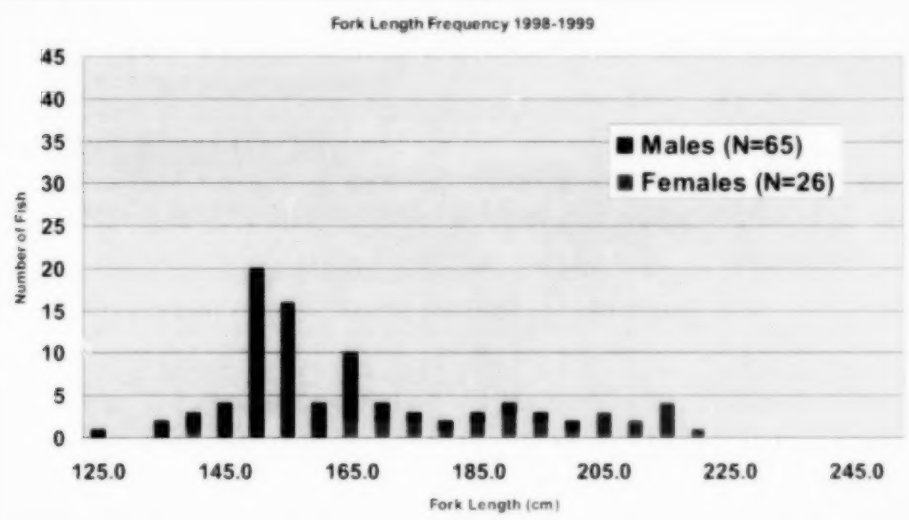
The age structure of Atlantic sturgeon in the Saint John River has not been reliably determined using calcified materials of individuals. However, length, weight and sex data were collected from the commercial catch on the Saint John River in 1998 and 1999 (Figure 4a), as well as in 2007 and 2008 (Figure 4b). Results show a similar size composition between these two time periods.

Application of the size at age curves from the St. Lawrence River population as calculated using the following von Bertalanffy growth parameters (Magnin 1964; Linf=314.7, t_0=-0.7542, k=0.0315) indicates that a broad age distribution of spawners occurs in the exploitable population in the Saint John River with at least 20 age classes represented (Figure 5). Using growth rates from the Hudson River population results in age estimates that are younger at length with a slightly more truncated age structure (Figure 6). Growth rates of Atlantic sturgeon in the Saint John River are thought to be closer to those in the St. Lawrence River than in the Hudson River based on climate information; however, they may fall somewhere between these two populations. The samples collected in 2008 and used in this analysis are not representative of the likely breadth of the total spawning population given gear selectivity (gillnets of 13 and 14 inches). Gillnets preferentially select mature individuals, including smaller (and presumably younger) spawning females.

There was a difference in the sex ratios of samples taken in 1998/1999 as compared to 2007/2008, with a higher percentage of females captured in the 2007/2008 sampling. This suggests that mature females are now a larger component of the exploitable population

Age composition information has also been collected on fish captured in the Minas Basin from 2004-2008 using non-size selective gear. However, these fish are primarily juveniles 3-29 years and are considered to represent a mix of several populations (M. Dadswell, Acadia University, pers. comm.).

(a)



(b)

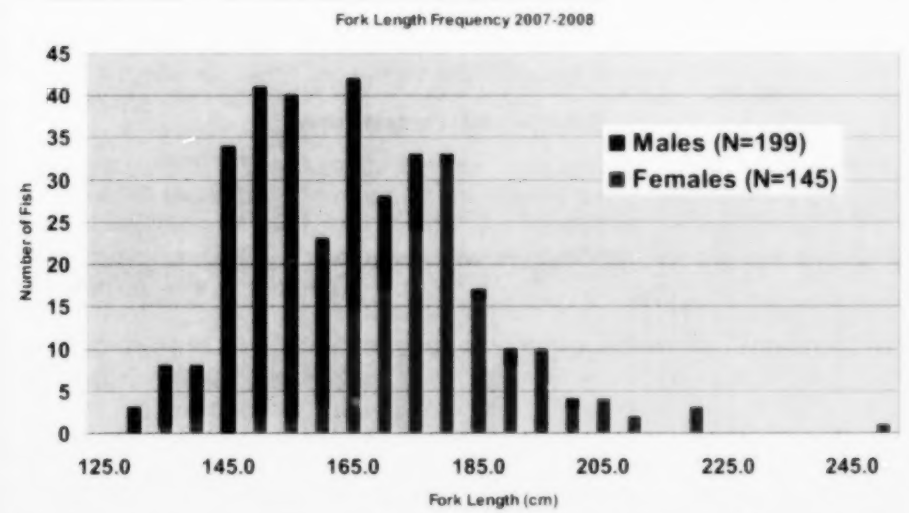


Figure 4. Length frequency distributions of the commercial catch of male and female Atlantic sturgeon in the Saint John River for the years (a) 1998 and 1999 and (b) 2007 and 2008.

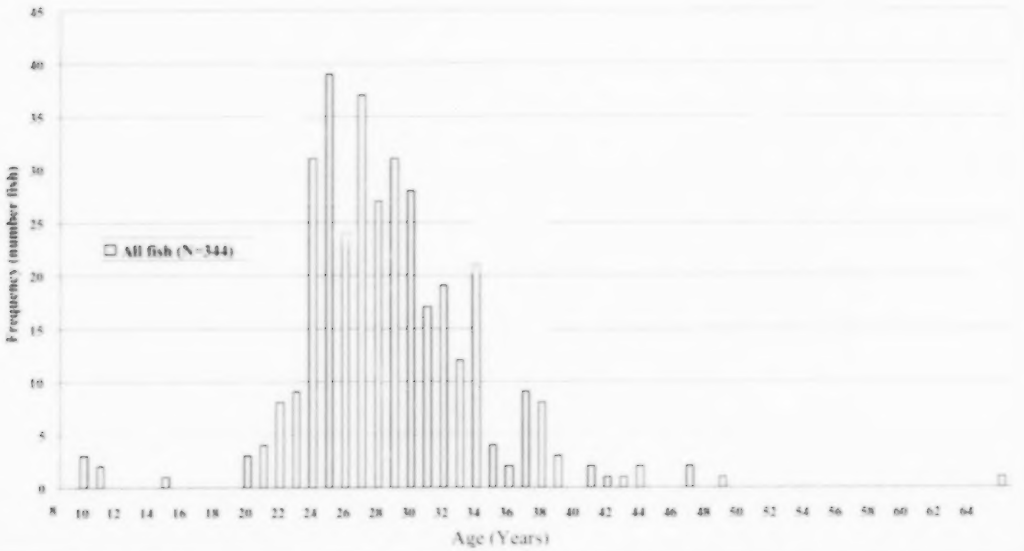


Figure 5. Estimated age structure of Atlantic sturgeon captured in the 2008 commercial harvest on the Saint John River using Von Bertalanffy data from Magnin (1964) for the St. Lawrence River (Linf=314.7, t0=-0.7542, K=0.0315).

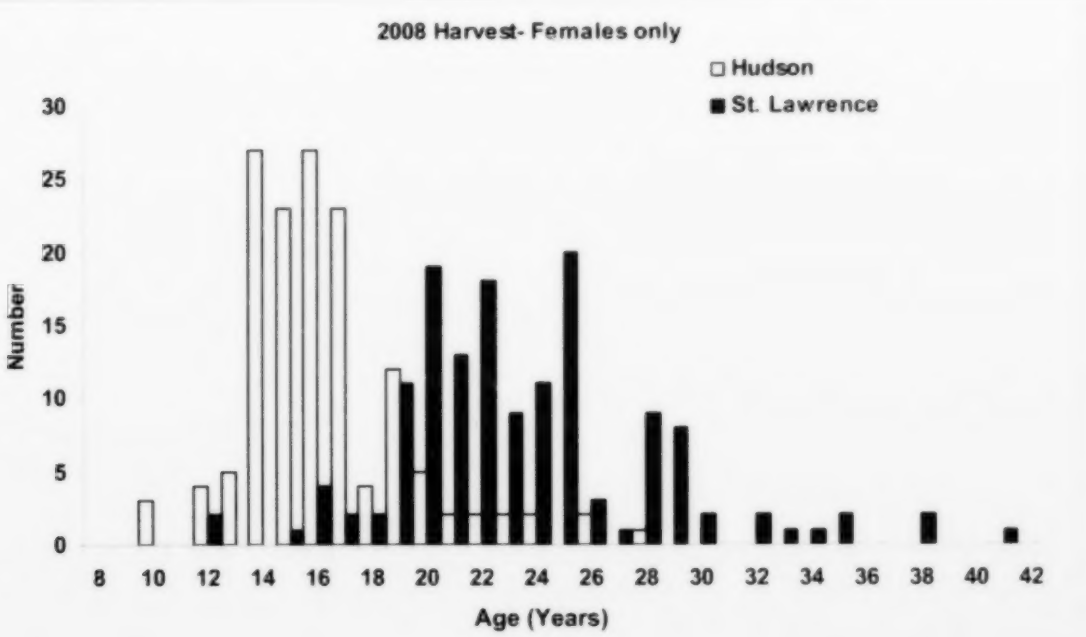


Figure 6. Estimated age structure of female Atlantic sturgeon captured in the 2008 commercial harvest on the Saint John River using growth information from the St. Lawrence River population to the north and the Hudson River population to the south.

Recruitment

Recruitment of Atlantic sturgeon in the Saint John River has not been documented but is suspected based on the ongoing presence of juvenile fish commercial catches and the broad size structure of the exploitable population.

Catch Per Unit Effort (CPUE)

It was not possible to develop a time series for CPUE with data available at the time of this review.

Threats

The primary source of human-induced mortality of Saint John River Atlantic sturgeon is from the commercial fishery. The recreational fishery has a release rate of approximately 98% and survival of Atlantic sturgeon that are released live is considered to be very high. Some sturgeon are authorized by DFO to be caught and retained for aquaculture purposes (i.e., breeding). It is prohibited to retain Atlantic sturgeon captured as bycatch in other fisheries, and illegal harvest of Atlantic sturgeon is not considered to be a threat in the Bay of Fundy. Enforcement is considered to have been very effective at minimizing retention of bycatch and illegal harvest. The Annapolis Tidal Generating Station is known to be a source of mortality for Atlantic sturgeon in the Bay of Fundy; however, the number of individuals reported to be killed each year is low (<5) and the proportion of these that are from the Saint John River is not known. There are no reports of Atlantic sturgeon mortalities from the Mactaquac Dam hydroelectric facility on the Saint John River.

Water quality is very good in the Saint John River, and no known impacts to Atlantic sturgeon have been reported. A concern for entrapment of alewife and blueback herring in human-made ponds along the wetlands of the lower Saint John River (e.g., impoundments for waterfowl, during spring and fall flooding and subsequent water level recessions) may also be relevant to other species such as Atlantic sturgeon.

Natural mortality of Atlantic sturgeon in the Bay of Fundy is not known. The broad range of age (size) classes suggest natural mortality is low.

Total Removals

The total number of Atlantic sturgeon that are removed from the Bay of Fundy population each year is not accurately known. Removals by the commercial fishery vary annually. However, using the average weight of individuals collected in 1998 and 1999 (33.6 kg), the approximate number of fish (measured as mt) that have been removed by the commercial fishery is estimated to have been approximately 400 Atlantic sturgeon per year since 1965. Fewer fish have been retained by the commercial fishery in the past 10 years than the historical average. In 2005, there were 41 recorded removals of sturgeon from the recreational fishery, and most of these are likely to have been Atlantic sturgeon. In 2002, 16 mature adult Atlantic sturgeon were authorized to be retained for artificial breeding, while another 20 were authorized to be retained in 2003. There are reported to be approximately 5 removals of Atlantic sturgeon in the Annapolis Basin each year (killed in the turbine). Total annual removals in recent years therefore appears to have been <500 juveniles and adults combined.

Sustainable Harvest Level

At the present, DFO does not possess sufficient information to allow for accurate estimation of the potential harvestable surplus of Atlantic sturgeon from the Bay of Fundy, nor specifically from the Saint John River. However, there is no evidence that the average annual reported landings from 1965-2002 of 12.6 mt, or approximately 400 fish (based on length and weight data collected in 1998/1999) has resulted in any significant changes to the observed relative abundance, size structure, or estimated age structure of Atlantic sturgeon in the Saint John River.

Given existing information, total removals that are within the average historical harvest levels are predicted to be sustainable for the short-term (i.e., 5 years). If the annual removals from recreational fisheries, Aboriginal fisheries, and incidental mortality combined are assumed to be approximately 50 fish, this would suggest a sustainable commercial harvest level of 350 fish (maximum) for the commercial fishery in the Saint John River. This proposed sustainable harvest level is based on a number of assumptions that should be re-evaluated as new information becomes available. The sex ratio of this harvest should also be taken into consideration, with a suggested male to female ratio close to 50:50 to minimize potential conservation concerns.

Sources of Uncertainty

Limited biological information is available from Atlantic sturgeon from the Saint John River. Of particular interest would be estimates of abundance across all age classes, as well as age and growth data for males and females. Information available for Atlantic sturgeon caught during 1973-1975 (M. Dadswell, Acadia University, pers. comm.) was not evaluated in this assessment.

The habitats of the life history stages in the river are unknown beyond the favoured location for commercial fishers. For example, spawning in the river has not been confirmed and movements/migrations from and into the river are unknown. Each of these factors impact the status of the population.

Effort information has not been evaluated for this fishery and is of interest.

There may have been changes in the productivity of the Saint John River since the construction of the Mactaquac Dam.

This assessment has assumed that the exploitable population of Atlantic sturgeon are resident Saint John River fish.

Bycatch mortality is assumed to be low based on the experience of the licenses holders and the effectiveness of enforcement in the Bay of Fundy and lower Saint John River.

CONCLUSIONS AND ADVICE

The exploitable population of Atlantic sturgeon in the Saint John River appears to have a healthy age structure and has supported a commercial harvest in the order of 400 fish per year over the past 40 years of fishing activity. Other sources of human-induced mortality on Atlantic sturgeon in the Bay of Fundy are thought to be low and in the order of approximately 50 fish per

year. Non fishery sources of human-induced mortality are not expected to change from present levels during the next 5 years.

Based on the information available, a maximum commercial harvest of 350 Atlantic sturgeon from the Saint John River is considered to be sustainable over the short-term (5 years). The sex ratio of this harvest should also be taken into consideration, with a suggested male to female ratio close to 50:50. This harvest level is based on a number of assumptions that should be re-evaluated as new information becomes available.

However, a formal species assessment including the acquisition of robust life history, abundance, and age-structured genetic data is recommended before future harvests are considered. Data collection from the commercial fishery may represent the only realistic opportunity to gather information related to Atlantic sturgeon in the Saint John River for the foreseeable future.

Management Considerations

Monitoring

There is no fishery-independent monitoring of Atlantic sturgeon abundance on the Saint John River. The only method currently in place to monitor changes in the population is fishery log books. The completion and return of detailed log books is a condition of the commercial licenses, although the extent of compliance with this regulation is not clear. Log books have been modified in 2008 to include reporting requirements for daily catch, effort, size, and sex of sturgeon caught.

It is recommended that more inclusive and, therefore, accurate monitoring take place so that appropriate information is place for the next assessment of Atlantic sturgeon.

Management Measures

Although there is no quota for the Atlantic sturgeon fishery in the Bay of Fundy, the fishery is subject to gear and effort restrictions. There are currently eight commercial license holders for this area, but only two are currently active. All sturgeon licenses are terminal (i.e., they cannot be transferred to another individual), and the licenses cease to exist if/once the license holders leave the fishery.

Atlantic sturgeon may only be fished commercially with gill nets having a minimum mesh size of 330 mm (13 inches), which has been implemented to reduce the catch of juvenile sturgeons and prevent bycatch of other species. A complementary maximum mesh size limit could increase escapement of larger bodied mature females.

The commercial fishing season is closed during the month of June to protect spawning adults. This represents about one third of the spawning season (which typically occurs annually from the end of May to August). This seasonal closure could be modified, if necessary, to protect a greater proportion of the spawning biomass.

Regulations prohibit the retention or possession of Atlantic sturgeon <120 cm in total length, which is the presumed length at first maturity, in both commercial and recreational fisheries. Retention of incidentally caught sturgeon in other river and coastal commercial fisheries is prohibited by regulations.

Recreational angling for Atlantic sturgeon is permitted with an open season (except for the closure in June to protect spawning adults). There is currently no bag or possession limit for this species, but one could be implemented if required. There is one angling tournament for sturgeon on the Saint John River. Entry rules require live release of all angled sturgeons.

Dockside monitoring is not currently in place for the Atlantic sturgeon fishery, but it could be implemented to ensure that the fishery does not exceed the recommended maximum catch of the commercial fishery.

Aquaculture facilities are currently required to obtain Atlantic sturgeon from the legal commercial fishery or through application to DFO. Any future approvals of removals for aquaculture purposes will be counted against the sustainable harvest level.

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ISSN 1919-5079 (Printed)
ISSN 1919-5087 (Online)
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CORRECT CITATION FOR THIS PUBLICATION

DFO. 2009. Evaluation of Atlantic Sturgeon (*Acipenser oxyrhinchus*) in the Maritimes Region with Respect to Making a CITES Non-detriment Finding. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/029.